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THE PREVALENCE OF TUBERCULOSIS IN CHILDHOOD AND THE
CONDITIONS OF OUR MILK SUPPLY.

h. J. 1913



G. H. Dart

The Prevalence of Tuberculosis in childhood.

Discussion of evidence for and against milk as the cause of infection.

Evidence pointing to widespread infection of our milk supply.

Powers for dealing with existing conditions

(a) General powers

(b) Under Local Acts.

The deficiencies of existing powers.

Suggested additional legal powers.

Consideration of some foreign methods.

Suggested methods of elimination of bovine-tuberculosis by means of co-operation between farmers and health authorities, combining American and Danish efforts at control with an amendment of our existing systems.



THE UNIVERSITY *of* EDINBURGH

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Prevalence of Tuberculosis in Childhood.

Discussion of the evidence for and against milk as
the cause of infection.

Perhaps the best way to arrive at an understanding of the importance of this subject will be to discuss first the amount of tuberculous infection proved to be present amongst our schoolchildren and then to discover as far as possible to what extent the milk supply may be to blame.

This is not an attempt to prove that given a pure food supply tuberculosis would disappear or to minimise the importance of the methods now being carried out. It is really an attempt to show that another side of the question has not received the attention which it merits, to discuss the reasons why this state of affairs has come into being, and to suggest measures whereby this evil might be remedied. It is a suggestion that a section of the Public Health side of the Edinburgh method of dealing with tuberculosis is in one respect a failure at present owing to imperfect powers, imperfect organization.

Fowler (Infant feeding and Practical guide to the artificial feeding of infants.) states:-

"Abdominal tuberculosis is unusually prevalent in Great Britain as compared to other countries."
 "and post mortem experience shows that at least 25% of all cases of fatal tuberculosis in children are primarily abdominal" and "The risk of tuberculous infection by means of milk is very real."

The percentage of tuberculosis in school children is given by Sir George Newman in his annual report as follows.

	1908	1909	1910
Routine cases	1.02	.75	.67
Routine and Specials "	1.31	1.22	1.09
Special cases only	1.97	2.02	1.80

He states:-

This table gives an approximate idea only of the number of cases of tuberculosis present among school children." The actual percentages are without doubt considerably higher."

(The extreme prevalence of this disease has been pointed out by many other observers.)

Osler's Principles and Practice of Medecine. "Of 2,576 autopsies made on children 27.8% who died in the first year were tuberculous."

De Riviere in the Lancet Jan. 1910.

Connalman Baginsky Heller Hamburger Ganghofer

Number of Necropsies	220	806	714	150	972
Number Tubercular	35	144	140	32	252
Percentage Tubercular	16%	18%	20%	21%	25.9%

The figures refer to children who died from some acute disease (e.g. diphtheria) which was not tuberculosis.

Hamburger(1) states that 94% of school children show signs of tubercle by the time they reach 14 years.

1. Hamburger. Freq. of T.B. in childhood. Vol.2. 1910.

Hay (1) found 6.7% of absentees with definite signs of the pulmonary form.

Taylor (2) from results of medical inspection of school children in the county borough of Halifax states:

"1% of school children show definite physical signs, 3% are definitely pre-disposed - the pre tuberculous."

Sir Robert Philip in the address delivered before the tuberculosis conference at Manchester June, 1912, stated that 30% of school children have stigmata of tuberculosis. His results were obtained from 1000 children examined at the Royal Victoria Hospital.

Naegeli of Zurich found post mortem tuberculous foci in 33% of children aged 5 to 14 years.

Woods Hutchison (3) states:- "As recently as 5 years ago percentages of Tuberculous lesions in children ranged from half of one per cent up to 6%. Now the proportion of cases of tuberculosis admitted to children's Hospitals has reached 25%, 30%, and 35%."

Holts latest reports 41%. He also states that "the data at our disposal show that tuberculosis of all varieties is vastly more common in young children than was previously believed and while they do not as yet appear to have thrown much light upon the precise source of infection whether human or bovine, inhalation

(1) Hay. Lancet, Vol. 1. 1908.

(2) Taylor. The Tuberculous Schoolchild, British J. of tuberculosis. 1911. Vol. 5. No. 3.

(3) Woods Hutchison British Journal of Tuberculosis Jan. 1912.

or ingestion, yet they do justify us in regarding the question of infection as in large measure a problem of infancy and early tuberculosis.

Kelnyack says the returns vary from $\frac{1}{2}$ to 6%, his own view being that pulmonary tuberculosis is of frequent occurrence though often overlooked. Hellenberg writing on this subject gives some other of Nägeli's results. Out of 284 deaths, P.M's. showed only 6 were free from tuberculosis and he found as the result of 1000 inoculations in healthy and consumptive patients that double reaction i.e. with both Loch's old and Bovine tuberculin only occurs when patient infected with Bovine. From 516 children, 37 or 7.15% gave a positive reaction.

Refs.

Wood Hutchison. British Journal of Tuberculosis
Jan. 1912.

Kelnyack. Journal of Royal Institute of Public
Health, 1908.

Philip. Medical Officers. (quoted) Dec. 13.
1909.

Hellenberg. Zeitschrift für Hygiene und
Infektions.Krankheiten. (Vol. LXIV.)
Part 3. Nägeli.

The idea held by many eminent men is that the present large number of sufferers from tuberculosis have been infected from a human source and that if this human source of infection can be removed the disease will cease to be propagated. This idea is ^{concisely} stated by Bierner who says:- "Tuberculosis is a bedroom disease."

Another view is that although there can be no doubt of the huge numbers of people infected from human sufferers yet there is also another extremely important source of infection - food infection, infection by the bovine bacillus, causing both pulmonary and other forms of tuberculosis.

There is great division of opinion also as to whether infection is brought about by inhalation or ingestion.

That is an important point for if infection, and particularly pulmonary infection is only brought about by inhalation the question of a milk supply infected by the bovine bacillus becomes of little importance regarded only as a cause of the present wide-spread tuberculous infection.

Some of the views held by authorities are:-

1. Infection from a human sufferer by inhalation the sole important cause of tuberculosis.
2. Infection from a human sufferer by ingestion the alimentary canal being the path of infection.
3. Infection from both bovine and human sources the alimentary canal being the path of infection.

4. Infection from both bovine and human source important, Bovine by ingestion, human by inhalation.
5. Infection from bovine and human sources both important in the production of Pulmonary and other forms of tuberculosis, infection from human sources taking place both by inhalation and ingestion and ~~and~~ from a bovine ^{source} case by ingestion.

This last seems to me the most probable, the results of the researches of a great number of observers seem to bear this out.

The inhalation theory is strongly held by Von Perqu~~it~~ (Address at annual meeting of German central committee for combating Tuberculosis. Berlin 1911.) who divides cases into Primary in the lungs and Secondary attack of bones and joints etc., through carriage in bloodstream. He mentions Behring but differs in that he says:- "Primary foci in the intestinal tract are rare the bacillus of bovine tuberculosis and infection due to the ingestion of cow's milk playing quite a subordinate part in transmission." But the absence of a focus in the intestine or neighbouring parts is not necessarily a proof that the infection did not enter by the intestine. The tendency of all bacilli is to attack a damaged part.

The view that the lung is first infected does not make it impossible that the entrance of infection was the intestine. Stiegl considers that human tubercle bacilli gain entrance by the alimentary canal, and Dr. Nathan Raw also writing in the Practitioner considers

that entrance with disease of the lung following may occur by the alimentary canal, but he thinks the bovine bacillus capable of doing this. It is significant that the Royal Commission found the Bovine Bacillus had a greater virulence than the human.

One would however naturally expect infection through milk to occur by the alimentary canal and to affect other organs and tissues in the neighbourhood. Infection by inhalation one would expect to affect the lung and to be the principal mode of infection by the human bacillus. That droplet infection by inhalation in the first place no matter what the subsequent path does happen has been shown by Flügges experiments, the well known Brompton Hospital experiments. Graham Smith reports in his lectures for the Public Health diploma the case of an investigator who infected himself in the Cambridge laboratories while conducting an experiment to demonstrate infection by inhalation, and many others can be found in any textbook. Many observers, in particular Still and Behring* consider infection by the alimentary canal most common. Behring believes that most pulmonary tuberculosis is contracted in childhood from drinking tuberculous milk, though the disease may remain quiescent for years, manifesting itself in later life as a result of the individual becoming run down in health or from some other cause.

*Refs.

Behring. "Tuberkuloseintatchung Tuberkulosebehämpfung und Säuglingsnahrung Berlin 1904.

Behring. Berlin Klin Wochensch pp.233,237,689. 1903.

The Royal Commission found that out of 42 pulmonary cases only two yielded bacilli of the bovine type alone, but 14 out of 29 cases of primary abdominal tuberculosis yielded bovine bacilli only.

Thus the tendency of a great many observers is to blame human infection for the spread of Phthisis and Bovine for a large share of other forms of Tuberculosis.

But there is one item of information in the Report which is very suggestive. Although generally the attempts to change the type of bacillus failed, in two cases after injection of bovine bacillus into dogs, the organism when recovered showed the characters of the human type.

Take for example the case of a youth of 18 years infected in infancy with bovine bacilli. Such a prolonged residence in the human system might well produce a bacillus which differs in many respects from the bacillus which has only been in residence in the human subject for a few months.

Five hundred days was the limit of time mentioned for observations of that nature by the Commission. The Commission also found the two different types of bacilli in the same lesion on some occasions. They found what may be called transition forms in certain lupus strains and admitting the high resistance of rabbits and calves to the human type they state:- "there remain only slight cultural differences on which to found the conclusion that the human and bovine types represent two distinct organisms. We

prefer to regard the two types as varieties of the same bacillus and the lesions which they produce whether in man or in other animal as manifestations of the same disease."

Thus it may be quite erroneous to conclude positively on isolation of a bacillus greatly resembling the human type, that the source of infection was therefore necessarily human and not bovine.

There is a great tendency to make that conclusion and many workers think only of a human source of infection in cases of pulmonary tuberculosis on that account.

Woods Hutchison* states:- "Even the glandular forms of tuberculosis do not represent an earlier or milder form of the infection but are secondary to a pulmonary involvement." The moderate but appreciable degree of immunity against pulmonary tuberculosis possessed by children who have manifested osseous articular or glandular forms of the disease is possibly to be interpreted on the theory that they have already survived a considerable degree of pulmonary involvement. The frequency of pulmonary tuberculosis is much greater in children than was generally supposed."

The fact that children show a far larger proportion of cases of bovine tuberculosis is an argument favouring the idea that milk supply was the cause, in the first instance, but it has not been finally shown that in adults who show a larger proportion of cases infected by the human type, the infection may not have been bovine in the first instance.

*Woods Hutchison. British Journal of tuberculosis. Jan. 1912.

But whatever the first origin there is no doubt of the part played by infected human beings in spreading the disease. Most public health work has been done with a view of combating this spread, and the tremendous fall in the mortality is due to this recognition of the spread of tuberculosis by human beings under certain conditions.

Both adults and children have benefited. But the fall in the mortality has been less marked in the case of children.

Children are more susceptible to the conditions surrounding them than adults so the altered improved environment due to public health activity should have lowered their death rate from this disease, if there were no other source of infection, to a greater degree than among adults. The less marked fall in the case of children is really what one would expect considering the dependence of children on their milk supply, and the logical result of a tuberculous supply. This question of lessened mortality I will discuss later on from the point of view of the difference in the fall of mortality in Pulmonary and "other forms of Tuberculosis" and the difference in the fall in infancy and at later age period.

It is interesting to note in the Practitioner Special Number on Tuberculosis the opposing opinions held by regard to this question of infection by means of cows' milk.

In favour of the Theory of
the importance of Bovine
infection

Against

Dr. Horder.

Dr. Gordon Watson.

Dr. J. Walter Carr.

Dr. Pritchard.*

Sir R. D. Powell.

Dr. Theodore Thompson.

Dr. Nathan Raw.

Dr. Acland.

Dr. Glaister.

Dr. Priestley.

*Dr. Pritchard and Dr. Gordon Watson's remarks are of great importance looking at the subject from this point of view.

Pritchard deduces the following from Hamburger and Monti's figures of the mortality rate among children.

"Tuberculosis is the commonest of all diseases to which childhood is liable. The congenital form of the disease is practically unknown although the phthisical diathesis is strongly hereditary and predisposes to the subsequent development of tuberculous processes. The incidence rate rises from zero at birth to 90% at the age of 14. On the other hand though tuberculosis is a terribly fatal disease during the first few months of life the mortality rate among those affected rapidly falls to about 2% at the end of the fourth year. Thus as far as tuberculosis is concerned children may be said to be highly susceptible, but, with the exception of the first two years of life,

little liable to fatal results."

"Without suggesting for one moment that the controversy has reached finality I would summarise the more important aspects of the question by saying, that, tuberculous disease is generally of the human type and conveyed by direct contact through the medium of the air: that the bacilli may enter the system by several routes and that they are ultimately arrested in Gmph nodes, the permeability of which to solid matter is impaired or which otherwise offer a favourable nidus for growth."

In my opinion those statements are misleading for the following reasons.

1. Pulmonary and other forms of tuberculosis are linked together - but they have not fallen equally at the same age periods.

2. In Sir George Newman's 1908 report will be found a table taken from the Registrar General's figures showing that:-

A. Deaths from "Other forms of Tuberculosis" has its maximum rate under one year of age, decreasing steadily at subsequent age periods.

B. Phthisis has fallen in infancy to a greater degree than deaths from "other forms."

C. The decline from 1901 - 1909 in "Other forms of Tuberculosis" (given as 19% by the Medical Officer to the L.G.B.) has mainly taken place in Adult life and is due to improved sanitary conditions ~~and improved sanitary conditions~~ and improved means of

dealing with tuberculosis. Infant life has not benefited equally owing to its dependence on the milk supply.

The above facts which are matter of common knowledge and borne out by statistics seem to me to point to some factor operating more heavily in the case of the child and I believe the milk supply to be this factor.

Why is the death rate from "Other forms of tuberculosis" greatest in infancy than at any other age period while the highest death rate from Phthisis occurs at a much later age period?

In my opinion the greater number of the deaths from "Other forms of Tuberculosis" are due to bovine infection and that a certain number of the deaths from Phthisis at the maximum of the age mortality curve of Phthisis are due to the previous infection in infancy.

If the infection is human and air borne in both forms why should "other forms of tuberculosis" have a greater mortality in infancy, surely Pulmonary tuberculosis is more deadly than glandular and other forms to infants.

Newsholme* considers that a disease with low mortality soon after birth which increases at later periods of life is one on which congenital influences have little power.

But Pritchard says that the Phthisical diathesis is strongly hereditary - that is to say although

*Newsholme. L.G.B. Ref. Infantile Mortality.

favoured by hereditary influences yet Phthisis does not kill in infancy as other forms of tuberculosis does.

It seems to me that at the different ages one mode of infection is more important than the other. Thus in infancy, milk with subsequent glandular infection which glandular infection may produce other forms of tuberculosis, is the more usual mode of infection, and in childhood when dusty games - a child passes most of his life on the floor - are in progress and when milk is not an all important article of diet, dust and sputum infection are more general.

I do not believe that the infection gained through milk cannot produce a pulmonary tuberculosis resembling a typical case produced by infection from a human being.

Nathan Raw says:- "A neglected tuberculous gland is a potential danger.

At any time the bacilli may be liberated into the blood stream causing a generalized tuberculosis" and "Lymphadenitis tuberculosis^a is a very frequent infection in children and is in my opinion almost always the result of drinking milk containing tubercle bacilli. The bacilli are arrested by the tonsils or in the cavities of carious teeth, and thence conveyed direct to the lymphatic glands. If the glandular infection is neglected it may extend down to the clavicle and directly infect the glands of the anterior mediastinum, resulting in pulmonary tuberculosis. I have observed 38 such cases during the last 15 years

and post mortem examination has confirmed the diagnosis of direct infection of the lungs from the neck glands."

Nathan Raw. Practitioner Tuberculosis Number.

Before mentioning Mr. Gordon Watcon's article in the "Practitioner", I would like to refer to the statement often made that because in some countries where little milk is drunk consumption is rife, therefore the milk supply has little to do with the spread of the disease. An answer to that statement is that in those countries no attention need be paid to the milk supply, (although a cow may pass millions of bacilli in its faeces as has been shown by Graham Smith) but in this country we do drink milk and a great deal of evidence goes to show that the milk we drink is responsible for a great deal of disease. No one could hope to stamp out consumption in this country by merely dealing with the milk supply. All one wishes to point out is that the regulation of the milk supply is an extremely important and extremely neglected part of the great scheme of dealing with Tuberculosis. The well-known statements of the Royal Commission are too apt to be forgotten.

"There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject especially in children is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis and there can also be no doubt that in the majority at least of these cases the bacillus is introduced through cows' milk. Cows' milk containing bovine

tubercle bacilli is clearly a cause of tuberculosis and of fatal tuberculosis in man." "A very considerable amount of disease and loss of life especially among the young must be attributed to the consumption of cows' milk containing tubercle bacilli." And in the final Report:- "Of young children dying from primary abdominal tuberculosis, the fatal lesions could in nearly half the cases be referred to the Bovine bacillus, and to that type alone. In children too, and often also in adolescents, suffering from cervical gland tuberculosis, a large proportion of the cases examined by us could be referred to the bovine tubercle bacillus."

This last statement is of particular importance if considered in connection with Dr. Nathan Raw's statement in the Practitioner that 38 post mortem cases of his own during the last 15 years confirmed the diagnosis of direct infection of the lungs from the neck glands, and that this infection of the neck glands was in his opinion due to the use of tuberculous milk.

Gordon Watson states:- "If the tubercle bacillus gains an entrance into the intestine through infected milk or other food a primary tuberculosis may result but it is extremely rare to find post mortem evidence without evidence of tubercle elsewhere" and he also quotes Professor Somani as saying that the gastric juice of the pig is capable of destroying the vitality of the tubercle bacillus, and doubtless the human gastric juice is equally protective."

This view however is not held now by many. Carr in the Practitioner says:- "Tuberculous disease is prevented by the acidity of the gastric juice. Unfortunately although this acidity is sufficient to save the stomach itself from being infected, it is often not sufficient actually to kill the bacilli, particularly if they are protected by viscid mucus as in the sputum, and especially in young children in whom the normal acidity of the gastric juice is less than it is in adults. Sir William Whitler in the Cavendish lecture which he delivered in 1908 stated this view, when he said "In the immense majority of cases, pulmonary tuberculosis is not contracted by inhalation but by the ingestion of bacilliferous products which penetrate the intestinal mucosa."

These three following statements undeniably true and exemplified particularly well by Sir George Newman, 1908 L.G.B. report are significant.

1. The mortality from non-pulmonary forms is highest in infancy and diminishes at each subsequent age period.
2. That while in childhood the mortality due to Phthisis has fallen at a greater rate than mortality due to non-pulmonary forms (which plainly points to a lessened human and steady bovine infection) the reverse is the case at all ages together (which plainly points to the lesser influence of milk supply to adult as compared with infant life).

McEwen writing in the British Journal of Tuberculosis 1911 states:-

"It is striking that of the 60,000 persons roughly speaking who annually die from tuberculosis in this country, 11,000 are children under 5 years of age, i.e. 11,000 deaths in that section of the community which depend on milk for its nourishment. The decline of human tuberculosis has of course been due to improved hygienic conditions. It should be noted however that there has been little decrease in the intestinal tuberculosis among children, a form which more than other would naturally be attributed to milk."

Evidence pointing to widespread infection of
our milk supply.

Some of the reasons for this condition of
affairs with some results obtained by better methods of
cow-keeping.

Let us now consider the present state of our milk supply.

The conditions are admittedly very bad in most areas. The dairies cowsheds and milkshops orders with their limited functions and the Regulations which local authorities can make under them of ensuring hygienic conditions at least, are not in existence in some areas and in others there is no attempt to enforce them. In Cambridgeshire for example much of the milk supply is carried on under conditions which can only be described as disgusting even from the point of view of ordinary cleanliness, although the Regulations under the orders are supposed to be enforced. Cows live under conditions which might have been designed for the express purpose of inducing tuberculosis.

Hope in Liverpool (Public Health Journal Dec. 1911) states of 228 samples of milk from town dairies 12 or 5.2% were affected and of 67 samples from country dairies 9 or 13.4% were affected.

Kanthack and Sladen*investigated the supply of milk to Cambridge colleges and found that 9 out of the 16 dairies which supplied the colleges were selling tuberculous milk. The Public Health Committee of the L.C.C. reported that of 760 samples of milk taken at London railway termini during quarter ended March 31st. 1911, 106 or 13.9% were tuberculous of 5,698 samples taken since 1907, 640 or 11.2% were tuberculous. The council passed a resolution urging

* Kanthack and Sladen Public Health Dec. 1911.

president of L.G.B. to bring in a pure milk bill.

Newman* gives the following figures:-

London 1901, 7%: Islington 1903, 14.4%:

Croydon 1901, 6.7%: Manchester 9.5%: Woolwich 1902, 10%:

Liverpool 1902, 8.7%: Camberwell 1902, 11%:

At those dates the investigations would not be as accurate as they are now and the Cambridge figures probably give a better idea of the state of affairs as they are now in the more backward administrative areas at any rate.

Fowler in 'Infant feeding a Practical guide to the artificial feeding of infants', states 5% of random samples contain tubercle bacilli, the incidence being greater in town than country specimens.

Delepine (L.G.B. report 1908) states:

"One can say without exaggeration that there are few herds of more than ten cows that do not include one or more tuberculous cows."

He found that the percentage of farmers sending tuberculous milk to Manchester varied from 5.7 to 13.6, the average over a long period being 8.6. He stated that the suggestion that all cows should be tested with tuberculin and the affected animals killed is impracticable. The amount of compensation would be enormous and the killing of about 25% of our milch cows

* Newman.

would cause a milk famine.

21.2% of the farms and 28.3% of all the cows supplying milk to Manchester have he says at one time or another been tuberculous.

There is no doubt that a great deal of this state of affairs is due to sheer obstinacy and ignorance on the part of the farmer. The old superstition that a cow kept in a dark and badly ventilated cowshed gave more milk than one living under healthy conditions is still very much alive.

The authorities in Denmark by continual instruction educate their farmers into a knowledge of the true facts.

It stands to reason that cattle, herded together under what are after all unnatural conditions with some of their number infected with absence of all disinfection and in insanitary premises, should contract the disease.

Garrett M.O.H of Cheltenham (Annual Report 1909) after conducting observations on the way in which a herd of Guernsey cows - not a hardy breed - reacted to an open air life found they were healthier hardier and gave as much milk. He also quotes experiments of Wood who kept 45 cows in the open day and night all the year round with the same results.

Buckley at Basingstoke (Country Life 1911) kept a Shorthorn herd in the open air with good results. The herd was also tested twice a year with

tuberculin.

The fact that people engaged in dairy and work amongst cattle should not be tuberculous is fairly obvious.

The well known case of the sympathetic people who set up in a dairy a person incapacitated for other work by pulmonary tuberculosis, quoted in one of the Practitioner Tuberculosis articles, gives one an idea how lightly this subject is regarded.

POWERS for dealing with existing conditions

(a) General powers.

(b) Under Local Acts.

The deficiencies of existing powers.

Suggested additional legal powers.

Consideration of some foreign methods.

Suggested methods of elimination of bovine tuberculosis by means of co-operation between farmers and health authorities, combining the American and Danish efforts at control with an amendment of our existing system.

The condition of the Dairies cowsheds and milkshops of this country is supposed to be directly controlled by means of Regulations made under the Dairies Cowsheds and Milkshops Orders and approved by the L.G.B. Some local authorities have not even troubled to draw up any regulations, others do not trouble to enforce them.

In any case the wrong authority has been given power to draw up and carry out Regulations for this purpose.

The evil effects of allowing small local authorities to carry out such measures has been shewn for example by the result of allowing County Councils to delegate their authority under the Midwives Act to District Councils - which powers of delegation is about to be removed.

The power of enforcing the orders and regulations made under the Orders should not be in the hands of the small authorities.

Garrett (Annual Rep. Cheltenham 1909) states this idea in a different way when speaking of the examination of cattle for the detection of tuberculosis. He says:- "It is a matter for a veterinary surgeon but not for a veterinary surgeon appointed separately by every little rural district whose farmer councillors are his masters and whose private clients are among those whose cows he has to inspect. Nor is it possible to appoint a vet. to successfully examine cows and to cause the removal of those that are diseased whilst none of the other districts

around make any such appointment. This business cannot be worked except as the result of a general arrangement and it will be imperative to have some system of compensation for compulsory slaughter of cattle.

2. The Orders themselves are inadequate for dealing with the disease.

Thus the D.C.M.O. 1885, Article 15.

If at any time disease exists among the cattle in a dairy or cowshed or other building or place, the milk of a diseased cow therein:

- (a) shall not be mixed with other food,
- (b) shall not be sold or used for human food,
- (c) shall not be sold or used for food of swine or other animals unless and until it has been boiled.

D.C.M.O. 1899.

Article 15 of the 1885 Order was altered ~~so that~~ for the purposes of the paragraphs (a) and (b) to include under the heading of disease in the case of a cow "such disease of the udder as shall be certified by a Veterinary Surgeon to be tubercular."

The weakness of that legislation is evident.

1. A cow may give tubercular milk long before the udder is affected.
2. A cow may be passing myriads of bacilli in its faeces which may easily infect other cows and milk.

3. There is no power to deal with the infected cow or to prevent its removal or enforce notification of its removal or take really useful precautions to prevent the use of its milk.
4. Tuberculous milk is allowed to be given to pigs, expressly allowed, one might say. It has been shown (McEwen) British Journal of Tuberculosis Jan. 1911.* that in America the diluting of tuberculous milk did not prevent the infection of swine. This continued until a law was passed forbidding the practice of feeding swine with tuberculous milk.
5. There are no powers for disinfection of cowsheds.

Enlightened local attempts to deal with this state of affairs have not been successful. In 1899, an attempt was made in Manchester to deal with this state of affairs and under the Manchester Corporation General Powers Act special powers were given to deal with suspected milk consumed within the city, certain further sections were added in 1904.

These have been adopted in Liverpool, Sheffield, Birmingham, Leeds, Sunderland, among the great towns.

Up to the end of 1910 Local Authorities who have obtained model clauses as to tuberculous milk in local acts number 102.

It would appear however that in the majority of these areas these powers are in the main unenforced.

*McEwen. British Jour. of Tuberculosis. Jan. 1911.

These special powers have been in force in Manchester since 1900. These clauses require notification by dairymen of all cases of udder tuberculosis among cows in cowsheds sending milk into the city and prohibit sale of milk from such cows within the city. They give Powers for collecting samples.

Powers for inspection. Results in Manchester.

Delepine. Rep. of Medical Officer L.G.B.

1908 - 1909.*

"

Some diminution but apart from first few years not continuous or very marked.

Worst offenders dealt with at first. Amount of tuberculous milk for Manchester drops to about 6% and to about 9% Sheffield and there it remains. No regular consistent diminution in infective quality of milk.

As regards udder TB. There was no percentage diminution in either Manchester or Sheffield. In Sheffield during 1909 the Veterinary inspectors found as many as 42 cows with tuberculosis of the udder out of about 3,000 cows stalled in Sheffield city.

Finding these cases of udder tuberculosis cannot be considered as playing any effective part in the diminution of Bovine tuberculosis.

Apart from educational influence which they may exert their effect on the amount of Bovine tuberculosis in the country as a whole is for practical

*Delepine. Rep. of Medical Officer L.G.B. 1908 - 1909.

purposes nil as long as only locally applied.

As regards their effectiveness to protect the community the figures show that apart from their initial effects only a moderate degree of success has been attained."

A voluntary control of milk supply has been in operation at Plymouth.

The Farms are inspected twice a year.

The Local Authorities grant certificate and advertise that the premises are sanitary and comply with the regulations of the corporation. There is no Veterinary inspection and no bacteriological examination of milk.

The milk is no doubt clean but not tuberculous free milk.

It is evident that general action is needed that the present legislation is insufficient and that local acts are of little value.

A Resolution of St. Helen's Health Committee 1911 mentions some essentials of successful action.

"That in view of the serious menace to Public Health arising from the extent to which tuberculosis exists at the present time among milch cows the presidents of the L.G.B. and Board of Agriculture and Fisheries be urged to accelerate the promised legislation which shall injoin on all L.A's throughout the country uniform and efficient action and to make provision in such legislation for the reasonable

compensation of the owners of cattle for loss involved in the compulsory slaughter of diseased animals.

That in the legislation referred to in the above resolution provision also be made for the payment of compensation to butchers voluntarily surrendering tuberculous carcasses.

It seems to me that butchers ought to be protected against farmers. A farmer should be compensated where the authority detect and kill infected cattle. But where the farmer sells stock to a butcher, the farmer should not be able to patch up diseased animals get a good price for them and let the butcher bear the loss. A person should not be allowed to sell a bad animal as a sound one any more than a rotten piece of cloth as sound.

The farmer should have to pay the difference in any such case. This would make it doubly to his benefit to breed good stock and protect the butcher from the temptation to try and sell his tuberculous meat for human food.

Milk Certification.

This is a valuable help towards securing purity of milk as it not only ensures proper conditions as far as lies in the farmer's power but also gives the efficiency of the methods of supply public recognition. At present unless the farmer is under contract with some enlightened company (such as the Aylesbury

dairy company who insist on proper conditions, the breach of which entails a heavy penalty, on veterinary examination by their own veterinary surgeons at monthly intervals and a monthly certificate from a medical man generally the M.O.H. the farmer considers that it will not pay him for his trouble. Certification changes that and makes it worth his time and trouble. This method first brought into prominence in America by Dr. Coit of Newark, New Jersey, has now been recognised there by the state. Certificates are provided by a voluntary society of medical men. The New Jersey 1909 act provided for the["] incorporation of Medical milk Commissioners and certification of milk under their["] directions. The milk commission in New Jersey arranges

1. A standard of bacterial content.
2. A systematic routine of inspection and surprise inspections for observation of the health of the milking staff.
3. For Veterinary inspection and tuberculin testing of the herds.

At present the farms are visited once a month by a vet; and new additions and old members of a herd are tested with tuberculin at least once a year.

The Milk Commission provides with a certificate available for a month only and permits the farmer to use the term 'Certified Milk'. Improper use of certificate is heavily punishable.

Coit's Medical Society combines under its control Dairyman, chemist, bacteriologist, Veterinary surgeon and Medical inspector.

A modification of such a method might easily be introduced into this country. The Commissions in New Jersey are composed of medical men who give their services voluntarily, but use could be made over here of the larger Public Health bodies, as County Councils for example or special committees administering the provisions of the Act. Even the Health Committees. The one essential should be that the power is taken from the small authorities and administered (under power of appeal) by disinterested bodies of men. This system could be combined with the Government system now in force in Denmark. Clauses making it impossible for a tuberculous animal to be removed could be introduced and worked as successfully as in the case of Foot and Mouth, or any other disease. It is well known that cows discovered by Veterinary inspectors to be riddled with tuberculosis are merely sent to other parts of the country to carry on their mission of spreading disease.

In Denmark the Bang system is in action and it is probably the most efficient and at the same time causes less dislocation to the farmers milk trade than ^{any} other system. Of the three methods most advocated, namely, Ostertag, Vaccination and Bangs, ^A Bangs method is the most reliable. It is efficient and permits dealing with the diseased animals on

selective and preventitive grounds operating slowly.

Very briefly the main points are:-

1. Cattle with tuberculosis of the udder are killed. The Danish Government allows $1/3$ of market value of carcase and in addition compensation for such parts as are unfit for use.
2. Cattle are tested regularly with tuberculin.
3. Cattle which give the positive test are bred from but their calves are removed and fed subsequently on the boiled milk of their parents.
4. Cattle which give the negative reaction are rigidly separated from the others at grass and in the shed, and any subsequently giving a positive reaction are separated.

Thus there gradually grows up a tuberculous free herd.

This system was tried by the Corporation of Birmingham. In 1910 out of 1,111 cows which were tested 219 or 19.7% were tuberculous. At the end of 1910 twelve herds were free and three in process of being freed. The Corporation now possesses a totally tuberculous free milk supply.

The Danish farmers co-operate with the authorities, (Report on Bang's system. Public Health. 1912) about 2,500 samples of suspected milk are sent in yearly by the farmers themselves. Tuberculosis is found in about 30% of these. 700 affected cows are killed every year and compensation amounts to about £2,600 per year. Veterinary inspection and tuberculin

are supplied gratuitously by the State.

The educational value to the farmers of such co-operation is enormous in itself, instead of the farmer having to be forced by penalty to comply with health requirements, he learns to appreciate the value of them himself.

Instead of the friction caused by little local bodies attempting to administer the Acts, which if the Local bodies are efficient will not result in keeping down the tuberculosis of the country as a whole, and if the authorities are inefficient will result in no attempt being made, the country works together, all parts are equally concerned in the attempt, there is not the opportunity to deceive, and there grows up co-operation for the betterment of existing conditions.

SUMMARY.

1. The Prevalence of tuberculosis in childhood is extremely great.
2. There is evidence to prove that our milk supply is in part responsible.
3. The recent advances in the control of tuberculosis have not benefited the infant population as much as the adult owing to this fact of an infected milk supply.
4. The Prevalence of tuberculosis among milch cows is almost incredible in amount.
5. Milk as delivered to the consumer is infected to an enormous extent.
6. Existing farming conditions favour the continuance of tuberculosis amongst cattle.
7. The legal provisions for controlling tuberculosis amongst cattle are inadequate.
8. The legal provisions are administered by the wrong authorities.
9. Cooperation between Health Authority and farmer is the thing to aim at.
10. This can be brought about by the Danish system of control of tuberculous animals reasonable assistance to the farmer and fair compensation.
11. The total elimination of bovine tuberculosis should be the aim of the Government, brought about

slowly but with care to prevent human infection and with the minimum of loss to the country by amending the existing Orders, by encouraging milk certification and by introducing the methods which I have already enumerated which are being used with success in other countries.

The prevalence of tuberculosis in children and the contribution of our milk supply

J. H. D. J.

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The Prevalence of Tuberculosis in Childhood and the Conditions of our Milk Supply

G. H. Dart